

THE NETWORK CONFIGURATION OF AN OBJECT RELATIONAL DATABASE MANAGEMENT SYSTEM

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I. ABSTRACT:

The networking and implementation of the Oracle Database Management System (ODBMS) requires developers to have knowledge of the UNIX operating system as well as all the features of the Oracle Server. The server is an object relational database management system (DBMS). By using distributed processing, processes are split up between the database server and client application programs. The DBMS handles all the responsibilities of the server. The workstations running the database application concentrate on the interpretation and display of data.

II. INTRODUCTION:

Database management systems have evolved from hierarchical to network to relational models. Oracle extends the relational model to an object-relational model. The Internal Level, Conceptual Level, and External Level form the architecture of a DBMS.

A) Architecture of a Database Management System:

- Internal Level: The internal level describes the physical storage structure of database.
- Conceptual Level: The conceptual level describes the entire database for a community of users. It hides the details of physical storage structures and concentrates on describing entities, data types, relationships, user operations, and constraints.
- External Level: The external level describes how users view the data of the database.

B) The relational model has three major aspects:

- Structures are well-defined objects (such as tables views, indexes) that store or access the data of a database. Structures and the data contained within them can be manipulated by operations.
- Operations are clearly defined actions that allow users to manipulate the data and structures of a database. The operations on a database must comply to a predefined set of integrity rules.
- Integrity rules are the laws that govern which operations are allowed on the data and structures of a database. Integrity rules protect the data and the structures of a database.

C) Benefits of Relational Database Management:

- Independence of physical data storage and logical database structure;
- Easy access to all data;
- Flexibility in database design;

- Reduced data storage and redundancy;

The Object-Relational model allows users to define object-types. Object types specify the structure of the data and the methods of operating on the data.

C) An object type has three features:

- A name, which serves to identify the object type uniquely.
- Attributes, which are built-in data-types or other user-defined types.
- Methods, which implement specific operations that an application can perform on the data. Every object type has a constructor method that makes a new object according to the data-type's specification.

III. Client/Server Architecture and SQL:

The DBMS is divided into two parts: a front-end (client) and a back-end (server) portion. The advantage of this division is the distribution of processes over multiple processors. This reduces the processing load and improves the system as a whole. The client supports database applications; its focus is making requests and viewing data managed by the server. SQL (Structured Query Language) is the standard language for a DBMS. The server portion receives and processes the SQL statements that originate from client applications. SQL statements execute all operations on the information in an Oracle database. SQL statements are divided into the following categories:

a) Data Definition Language (DDL): DDL commands set up the data. They allow the programmer to create and alter databases and tables.

b) Data Manipulation Language (DML): The DML consists of those executable statements that transfer information to and from the database. You can update, insert, delete, and retrieve data in a table with these commands.

c) Data Sub Language (DSL): The end user uses a query language such as SQL or some application program. These languages include a data sub-language (DSL). A DSL is a subset of the total language that specifically deals with database objects and operations. The DSL is a combination of the DDL and the DML.

The database server must reliably manage large amounts of data in a multi-user environment so that users can collectively access the same data. The server instance is a combination of background process and memory buffers. The Oracle Server consists of a database and server instance. The purpose of the database is to store and retrieve related information. The System Global Area (SGA) is an area of memory used for database information shared by database users. When a database starts up, a SGA is allocated and background processes are started. Net8 is the mechanism the DBMS uses for interfacing with the communication protocols used by the networks that utilize distributed processing. Communication protocols define the way that data is transmitted and received on a network. In a network environment, the database server communicates with the client workstations using the Net8 software.

IV. Overview of Network Connection:

To successfully connect the Oracle Server to a Local Area Network (LAN) it must meet the standards of the Optimal Flexible Architecture (OFA). The OFA is the recommended scheme for configuring Oracle. A node is any computer that provides a service on a network. The node is configured so it can be identified on the network. The OFA employs a directory and configuration structure that can support the multiple components of the Server on a single node. Connecting the Oracle Server involves the following steps:

A) Layout of Operating System:

I configured the operating system to satisfy the hardware, software, memory, and disk space requirements. I created four mount points to comply with the OFA standard. These mount points are created for the installation of the Oracle Server. The first mount point is for where the software is to be downloaded. The second through the fourth mount points are for database files. I used File Transfer Protocol (FTP) commands to connect to Netscape's web-site. I transferred files from their web sight to the local system. Once these files were transferred to the local system, I was able to install a web-browser on the local system, thus enabling it with access to the Internet. Through the web-browser, I downloaded JAVA and C compilers onto the local system. These compilers will be used to develop Oracle applications.

B) Set UNIX Environment:

- I configured the Kernel parameters to accommodate the SGA structure of the Oracle Server. They control the allocation of shared memory and enable the database to startup.
- I created environment variables to the local system's **.profile** (pronounced dot profile) file. Directory paths are assigned to these variables. The Oracle Installer program downloads its files to these paths.
- I created UNIX accounts for a Database Administration (DBA) group and a database user group. Users assigned to the DBA group have access to all components of the Server. Only the DBA can startup the database instance. The DBA creates user accounts to the Server and sets the permissions for the individual users. The DBA also can create programs. Users assigned to the database user account can create programs and view the tables that the DBA grants permission.

C) Installation:

All the previous steps must be completed successfully in order for the Oracle Server to be correctly installed. The Installer program downloads the software into the paths defined in the local system's **.profile** file. The Oracle Server has been successfully connected to the LAN. An Internet Protocol (IP) address has been assigned to the local system. The IP address affords users the ability to Telnet to the local system.

D) Client Configuration:

Clients for the DBMS network were configured on Windows NT, 95, and 98 operating systems. Service names are aliases for the database server. The service name file contains the IP address of the server; the protocol to be used for client connection, in this case TCP/IP, and the name of the database instance the client will connect to. The Net8 software allows clients to communicate with the server

through service names. Using FTP, a copy of the service name file is sent to the workstations running the client applications.

E) The Client/Server Architecture Process:

1. The DBA starts up the database instance.
2. A client workstation runs an application. A user process is initiated through the application. The client connects to the server using the proper Net8 driver.
3. The server detects the connection request from the application and creates a server process on behalf of the user process.
4. The user executes an SQL statement and commits the transaction.
5. The server process receives the statement and checks the shared pool for any shared SQL area that contains an identical SQL statement. If the area is found, the server process checks the users' access privileges to the requested data and the previously existing shared SQL area is used to process the statement.
6. The server process retrieves any necessary data values from the actual data file.
7. The server process modifies data in the SGA. The Database Writer (DBWn) writes modified blocks from the database buffer cache to the data files. The Log Writer writes redo log entries to disk (LGWR).
8. If the transaction is successful, the server process sends a message across the network to the application. If it is not successful, an error message is transmitted.
9. Throughout this entire procedure, the other background processes run. The server manages other users and transactions.

V. Results:

The DBMS server and a Windows 98 client is located in the Physical Science, Environmental Science and Computer Science Advanced Computer Research Laboratory. Windows 95 clients are located in the Physical Science, Environmental Science and Computer Science LSAMP/ Learning Center Computer Laboratory and the Medgar Evers College Computer Laboratory. The successful network configuration of the DBMS has allowed the Introduction to Database Systems course to take place in a professional environment. I created user accounts for the students and implemented a backup and recovery system for the database.

VI. Conclusion:

The object approach in relation to a DBMS is a way to frame solutions to problems. It is an approach of abstraction that allows developers to represent entities with particular states and behaviors. Objects are manipulated according to specific protocol: this process is known as the object's interface. The result of this allows developers to reuse code in different applications or databases. It models the application or database as a set of objects collaborating with one another to fulfill their responsibilities.

The DBMS supports multi-users executing a variety of database applications operating on the same data and do not suffer from slow processing performance. The DBA can selectively control the

availability of data. The DBA has the ability to provide fail-safe security features to limit and monitor data access. These features enforce rules of data integrity. The result of this eliminates the need of coding and managing checks in developing database applications.

Oracle combines the data physically located on different computers into one logical database that can be accessed by all network users. The software is developed to work under different operating systems. The applications developed for Oracle can be transferred to any operating system with little or no modification. This feature allows different types of computers to share information across networks.

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